U.S. Department of Transportation
Federal Aviation Administration

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Advisory Circular

Subject:	**PART 91 PILOT AND FLIGHTCREW PROCEDURES DURING TAXI OPERATIONS AND PART 135 SINGLE-PILOT OPERATIONS**	**Date: x/x/xx**		**AC No:**	**91-XX**
		Initiated by:	**AFS-800**	**Change:**	

1. PURPOSE. This advisory circular (AC) provides guidelines for the development and implementation of standard pilot procedures for conducting safe aircraft operations on the airport surface. It is intended for use by Title 14 of the Code of Federal Regulations (14 CFR) part 91 operators and part 135 operators conducting single pilot flight operations. These guidelines should become an integral part of all standard operating procedures, flight operations manuals, and formal training programs. Standard use of developed procedures should be emphasized during the training of all pilots seeking certification and during the training of all pilots. The use of standard procedures for operating on the airport surface should further be emphasized during the flight review (refer to 14 CFR part 61, section 61.56) of all certificated pilots.

> **NOTE: Pilots operating aircraft under 14 CFR parts 121, 125, or 135 (those part 135 flight operations where 2 or more pilots are in the cockpit) refer to AC 120-XX, Part 121, 125, and 135 Flightcrew Procedures During Taxi Operations.**

2. FOCUS. This guidance focuses on the activities occurring on the flight deck/cockpit (e.g., planning, communicating, coordinating), as opposed to the actual control of the aircraft (e.g., steering, maneuvering). Although there are many similarities, taxi operations for single piloted aircraft, as opposed to aircraft that require more than one pilot, present distinct challenges and requirements. These distinct challenges are elaborated, when necessary, throughout the guidance. An addition section is provided concerning operations at airports without operating control towers. Finally, a section is devoted to the use of exterior aircraft lights in making an aircraft more conspicuous to other pilots.

3. RELATED READING MATERIAL.

a. Aeronautical Information Manual (AIM)

b. AC 90-42, Traffic Advisory Practices at Airports Without Operating Control Towers

c. AC 90-66, Recommended Standard Traffic Patterns and Practices for Aeronautical Operations at Airports Without Operating Control Towers

4. BACKGROUND. In the past, the process of getting to and from the runway was relatively simple compared to other phases of flight, and little attention was given to formalizing pilot procedures for airport surface operations. Also, formal training for flight deck procedures during airport surface operations has been inconsistent between organizations, and frequently received inadequate attention. As a result, a variety of pilot procedures evolved primarily based on what pilots have observed others doing or what just seemed right at the time. This lack of structure, standardization, and formal training is inconsistent with the goal of increasing the safety and efficiency of aircraft movement on the airport surface.

a. Recently, increases in traffic and expansion at many airports have created complex runway and taxiway layouts. This has made airport surface operations more difficult and potentially more hazardous than they were in the past. To increase safety and efficiency, it is necessary to lessen the exposure to hazards and risks by holding the flightcrew's workload to a minimum during taxi operations. This can be accomplished through procedures that allow the flightcrew to be prepared to devote their attention to only essential tasks while the aircraft is in motion. This requires the development and formalized teaching of safe operating procedures during taxi operations.

b. In developing procedures, it is important to consider existing pilot workload prior to take off and before landing. Considerations should be given to some of the tasks that make up the normal workload of all pilots, such as accomplishing checklists, setting navigational aids, configuring the aircraft for takeoff and landing, and managing communications with Air Traffic Control. Pilots of many large aircraft have additional tasks such as programming Flight Management Systems and data link messaging. In addition, pilots for large commercial operators are also tasked with voice or data link communications with their company. The more complex the activities within the flight deck/cockpit work environment, the greater is the need for formal and standardized procedures. The overall goal is to develop formal standardized pilot procedures that will increase the pilot's awareness but will not increase the pilot's workload while the aircraft is in motion on the surface of the airport.

5. SINGLE PILOT AND FLIGHTCREW PROCEDURES.

a. General. The potential for runway incursions can be reduced through adequate planning, coordination, and communication. The following guidelines are intended to help pilots cope more effectively with current airport conditions during airport surface operations. The guidelines are grouped into six major categories: Planning, Situational Awareness, Use of Written Taxi Instructions, Intra-flight deck/cockpit Verbal Coordination, ATC/Pilot Communication, and Taxiing.

b. Planning.

(1) Thorough planning for taxi operations is essential for a safe operation. You should give as much attention to the planning of the airport surface movement portion of the flight as you give to the planning of other phases of the flight. First, you should anticipate airport surface movements by doing pre-taxi or prelanding planning based on information on the Automatic Terminal Information Service (ATIS) and on previous experience at that airport. Second, once

taxi instructions are received, the prelanding or pre-taxi plans should be reviewed and updated as necessary. In aircraft operations where more than one pilot is in the cockpit, it is essential that the updated plan be understood by all flight crewmembers. Remember to review the latest Notices to Airmen (NOTAM) for both your departure and arrival airports for information concerning construction and/or taxiway/runway closures.

CAUTION: A potential pitfall of pre-taxi and pre-landing planning is setting expectations and then receiving different instructions from ATC. Flightcrews need to ensure that they follow the clearance or instructions that are actually received, and not the one the flightcrew expected to receive.

(2) Pre-taxing planning and briefing. For aircraft that require more than one pilot, the following guidance should be used to conduct a briefing of all flight crewmembers. For a single pilot aircraft, the pilot should be sure to adequately review this information.

(a) Take some time and study the airport layout. If you have a flightcrew, make sure the airport diagram is readily available to each flight crewmember. Check your expected taxi route against the diagram or taxi chart. Pay special attention to any tricky or complex intersections along the route. While planning for departure, be sure to consider the likely inbound taxi route at your arrival airport as well. If you have other flight crewmembers, make sure you identify critical times or locations on the taxi route (where verbal coordination between the pilot in command (PIC) and the second in command (SIC)/first officer (FO) will be necessary to ensure correct aircraft navigation and crew orientation.)

(b) For aircraft operations where more than one pilot is in the cockpit/flight deck, the flightcrew should plan the timing and execution of aircraft checklists and company communications at the appropriate times and locations so the pilot who is not taxiing the aircraft can be available to participate in verbal coordination with the pilot who is taxiing the aircraft. This action is needed to confirm compliance with ATC taxi instructions at the appropriate times and locations. When planning these tasks, flightcrews should also consider the anticipated duration of the taxi operation, the locations of complex intersections and runway crossings, and the visibility along the taxi route. If at all possible, during low visibility operations flightcrews should only conduct pre-departure checklists when the aircraft is stopped.

c. Situational Awareness. When conducting airport surface operations, you should always be aware of your situation as it relates to other aircraft operations going on around you as well as to other vehicles moving on the airport. You should know your aircraft's precise location on the movement area. Sometimes, this is a challenge, especially when you are at an unfamiliar airport, the airport layout and taxi routes are complex, or the visibility is poor. It is important for you to follow ATC instructions and clearances, to have and use an airport diagram, and to use the visual aids available at the airport, such as the signs, markings, and lighting, when taxiing on the airport.

(1) A pilot should know the aircraft's present location on the airport and should mentally calculate the next location on the route that will require increased attention. For example, a turn onto another taxiway, an intersecting runway, or any other transition points. In aircraft

operations where more than one pilot is on the flight deck/cockpit, the flightcrew should verbally share relevant information with each other.

(2) You can enhance your situational awareness by monitoring ATC instructions/clearances issued to other aircraft.

(3) Prior to entering or crossing any runway, scan the full length of the runway, including approach areas. In aircraft operations where more than one pilot is in the cockpit, verbally confirm scan results with other crewmembers on the flight deck/cockpit and have them do the same. Aircraft movement should be stopped if there is any difference or confusion on the part of any flight crewmember about the scan results.

CAUTION: Do not stop on a runway. If possible, taxi off the runway and then initiate communications with ATC to regain orientation.

(4) Be especially vigilant when instructed to taxi into position and hold, particularly at night or during periods of reduced visibility. Do not remain in position and hold on the departure runway for an extended period without direct communication from ATC. If you are uncertain about your status, or if you are uncertain about any ATC instruction or clearance, contact ATC immediately. If you suspect radio problems, observe the tower for light gun signals.

(5) Use extra caution when directed to use a runway as a taxiway, especially during reduced visibility.

(6) Use the utmost caution after landing on a runway that intersects another runway or on a runway where the exit taxiway will shortly intersect another runway. All crewmembers must have a common understanding of ATC's expectations regarding where the aircraft is to stop and must be able to identify the holding points. Immediately advise ATC if there is any uncertainty that you will be able to comply with their instructions.

CAUTIONS: 1. After landing, when you are on an exit taxiway that is between parallel runways, taxi your aircraft clear of the landing runway unless you are constrained by a hold-short line associated with the adjacent parallel runway.

2. Unless otherwise instructed by ATC, taxi clear of the landing runway even if that requires you to cross or enter a taxiway/ramp area.

3. At an airport with an operating air traffic control tower, never enter a runway without specific authorization. When in doubt, contact ATC.

4. At a non-towered airport or at an airport where the control tower is closed, listen on the appropriate frequency (CTAF) for inbound aircraft information and scan the full length of the runway, including the final approach and departure paths, before entering or crossing the runway. Remember that not all aircraft are radio equipped.

NOTE: For more information about operations at non-towered airports, refer to the current versions of AC 90-42, Traffic Advisory Practices at Airports Without Operating Control Towers, and AC 90-66, Recommended Standard Traffic Patterns and Practices for Aeronautical Operations at Airports without Operating Control Towers.

(7) After landing and exiting the runway, nonessential communications and nonessential flightcrew actions should not be initiated until clear (on the inbound side) of all runways.

d. Use of Written Taxi Instructions. At many airports, taxi instructions can be very complex, involving numerous turns and transitions, as well as runway crossing and hold short instructions. During these airport surface operations, pilots are very busy with a variety of cockpit duties and responsibilities that compete for their attention. Misunderstanding or forgetting any part of the taxi instructions can lead to an embarrassing or unsafe situation. Writing down taxi instructions, especially complex instructions, can reduce a pilot's vulnerability to forgetting part of a complex instruction and can be used to support airport surface operations as follows:

(1) For use as a reference for reading back the instructions to ATC.

(2) For crewmember coordination on the assigned runway and taxi route.

(3) For a short pre-taxi or pre-landing briefing on the pending airport surface operation.

(4) As a means of reconfirming the taxi route and any restrictions at any time during the airport surface operation without the need to call ATC for a repeat or clarification.

NOTE: While written taxi instructions are a good operating technique, common sense and flexibility should be used in determining the crew's need for them at a specific airport. For example, if the departure runway is very near the aircraft parking location, or if the crew has used the same taxi route numerous times in the previous days, it may only be necessary to record the basic elements of the taxi clearance. However, where the taxi instructions are complex or the crew in unfamiliar with the airport layout, a verbatim transcription of all instructions is desirable. Additionally, individual pilots may chose to develop a set of symbols and shorthand notations which allow them to clearly record and later recall key items in the taxi instructions.

e. Intra-flight deck/cockpit Verbal Coordination. It is essential that the flightcrew correctly understand and agree on all ATC ground movement instructions. Any misunderstanding or disagreement should be resolved to the satisfaction of all flight crewmembers before taxiing the aircraft. **It is the verbal aspect of this coordination that is most significant.** It is not enough to assume that all flight crewmembers have heard and understood instructions correctly. A common understanding can be enhanced by one flight crewmember repeating the instructions verbally and getting agreement on the content and intent

from the other flight crewmember(s). When flight crewmembers verbally confirm their understanding of the instructions, they then have a chance to discover and correct any misunderstandings and thus prevent hazardous situations from developing. This verbal coordination/agreement should be accomplished:

(1) When ATC issues taxi instructions for a departure, the flightcrew should refer to the airport diagram, coordinate verbally, and agree on the assigned runway and taxi route, including any instructions to hold short of or cross an intersecting runway.

(2) When ATC issues landing instructions, the flightcrew should coordinate verbally and agree on the runway assigned by ATC, as well as any restrictions, such as hold short points of an intersecting runway after landing.

(3) After landing and exiting the runway, the flightcrew should coordinate verbally and agree on the ATC taxi instructions to the aircraft's parking area, including any instructions to hold short of or cross an intersecting runway.

(4) At complex intersections, the flightcrew should verbally coordinate to be sure that the intersection is correctly identified and that the aircraft is transitioning through the intersection to the correct taxiway.

(5) When approaching an intersecting runway, the flightcrew should verbally coordinate in order to identify the runway. They should also verbally review the ATC instructions as to whether they are to hold short of or cross the runway.

(6) Before crossing any runway or entering a runway for takeoff or for landing, both pilots should visually scan to the left and to the right, including the full length of the runway and its approach paths, and coordinate verbally that the scan area is or is not clear.

(7) Before entering a runway for takeoff, the flightcrew should verbally coordinate to ensure correct identification of the runway and receipt of the proper ATC clearance to use it. Similar verification should be performed during approach to landing.

(8) When it becomes necessary for a flight crewmember to stop monitoring any ATC frequency, he or she should tell the other flight crewmember(s) when stopping and resuming the monitoring of the ATC frequency. Any instructions or information received or transmitted during that flight crewmember's absence from the ATC frequency should be briefed and reviewed upon his or her return.

(9) When the pilot not taxiing the aircraft focuses his or her attention on instruments in the cockpit, such as entering data into the aircraft's Flight Management System, and, consequently, is not able to visually monitor the aircraft's progress, he or she should verbally notify the pilot taxiing the aircraft. Likewise, notification should be made when that flight crewmember has completed his or her task and is again able to visually monitor the taxi operation.

f. ATC/Flightcrew Communication. The primary way the flightcrew and ATC communicate is by voice. The safety and efficiency of taxi operations at airports with operating control towers depend on this "communication loop." Controllers use standard phraseology and require readbacks and other responses from the flightcrew in order to ensure that clearances and instructions are understood. In order to complete the "communication loop," the controllers must also clearly understand the flightcrew's read back and other responses. The flightcrew can help enhance the controller's understanding by responding appropriately and using standard phraseology. Regulatory requirements, the AIM, approved flight crewmember training programs, and operational manuals provide information for flightcrews on standard ATC phraseology and communications requirements. Some of the most important guidelines that contribute to clear and accurate communications are included here.

(1) Maintain a "sterile" cockpit. Flight crewmembers must be able to focus on their duties without being distracted by non-flight related matters, such as eating meals, engaging in non-essential conversation, or reading material not related to the safe and proper operation of the aircraft. When operating an aircraft that does not have a door between the flight deck and the passenger compartment, the pilot may need to ask passengers to refrain from unnecessary conversation from the time the pre-flight preparations begin until the time the aircraft is clear of the terminal area and at cruising altitude. The same procedure should be followed on arrival, from the time landing preparations begin until the aircraft is safely stopped at the terminal.

(2) Use standard ATC phraseology at all times in order to facilitate clear and concise ATC/flightcrew communications.

(3) Focus on what ATC is instructing. Do not perform any non-essential tasks while communicating with ATC.

(4) Readback all hold short and runway crossing instructions and clearances, including the runway designator.

> **NOTE: Air traffic controllers are required to obtain from the pilot a readback of all runway hold short instructions.**

(5) Readback all takeoff and landing clearances, including the runway designator.

(6) Clarify any misunderstanding or confusion concerning ATC instructions or clearances to the satisfaction of all flight crewmembers.

g. Taxiing. This paragraph will not discuss speed management, steering, or maneuvering the aircraft, but will suggest some good practices regarding other cockpit activities during taxi.

(1) Prior to taxiing, a copy of the airport diagram should be available for use by the flightcrew.

(a) If you are operating a single-pilot aircraft, follow the aircraft's progress on the airport diagram to ensure that you are following the instructions received from ATC.

(b) For aircraft that require more than one pilot, a flight crewmember other than the pilot taxiing the aircraft should follow the aircraft's progress on the airport diagram to ensure that the instructions received from ATC are being followed.

(2) The aircraft compass or heading display is an excellent tool, as a supplement to visual orientation, for confirming correct taxiway or runway alignment. Refer to it as frequently as necessary, but especially at complex intersections and where the takeoff ends of two runways are close to one another.

(3) Low visibility conditions increase the challenge of safely moving the aircraft on the airport surface. Although visibility is technically designated as "low" when the runway visual range (RVR) falls below 1200 feet, visibility along the taxi route may be considerably less than the runway visibility. Use all resources available, including additional crewmembers, heading indicators, airport signs, markings and lighting, and airport diagrams to the fullest extent possible in order to keep the aircraft on its assigned route.

(4) Anytime you become uncertain about your location on the movement area, stop the aircraft and immediately advise ATC. If necessary, request progressive taxi instructions. The flightcrew should give ATC any information available about their position, such as signs, markings, and landmarks.

Caution. Do not stop on a runway. If possible, taxi off the runway and then initiate communications with ATC to regain your orientation.

(5) When cleared for takeoff, or to cross a runway, or when exiting a runway, do so in a timely manner. Inform ATC of any anticipated delay.

(6) After landing, **do not** exit onto another runway without ATC authorization.

6. AIRPORT SURFACE OPERATIONS NON-TOWERED AIRPORTS AND AIRPORTS WHERE THE TOWER IS CLOSED.

NOTE: For more information about operations at non-towered airports, refer to the current versions of AC 90-42, Traffic Advisory Practices at Airports Without Operating Control Towers, and AC 90-66, Recommended Standard Traffic Patterns and Practices for Aeronautical Operations at Airports without Operating Control Towers.

a. General. The absence of an operating airport traffic control tower creates a need for increased vigilance on the part of pilots operating at those airports. There are also specific communications procedures that differ from those used at towered airports. As is the case at towered airports, planning, clear communications and enhanced situational awareness during airport surface operations will reduce the potential for surface incidents at airports without an operating control tower. This section will focus on those aspects of airport surface operations that are unique to airports without an operating control tower and will not repeat in detail

information covered in other sections of this AC. Follow the guidance in the rest of this AC, but when operating at an airport without an operating control tower, also consider the following:

b. Planning. Along with the guidance in paragraph 5, the following should be considered when operating at an airport without an operating control tower:

(1) Familiarize yourself with the local traffic pattern. Remember, not all airports use a standard traffic pattern. Don't forget to check the pattern altitude.

> **CAUTION: During calm or nearly calm wind conditions, be aware that pilots may have a choice of what runway to land on or take off from, and that other pilots' choices may conflict with your own choice. Also, aircraft may be utilizing an instrument approach procedure to runways other than the runway in use for VFR operations. The instrument approach runway may intersect the VFR runway.**

(2) If there is more than one crewmember, brief your taxi plans and be sure that all crewmembers have a common understanding of the plan.

c. Situational awareness. While maintaining situational awareness is important in all circumstances, it is particularly important when operating at an airport without an operating control tower. To achieve situational awareness, you should be fully aware of your intended taxi route and be able to follow the planned route correctly. Without ATC to verbally tell you where you should taxi and where and when to stop, you must rely on visual cues to maintain situational awareness and maintain your planned taxi route. These visual cues include airport signs, markings, and lighting, together with the airport diagram. Other things to consider that can help you maintain situational awareness while operating at an airport without a working control tower:

(1) Monitor the appropriate frequency. Listen to what the pilots of other aircraft on the frequency are saying.

(2) If possible, monitor the approach control frequency to alert you to IFR traffic inbound to the airport.

(3) Prior to entering or crossing any runway, scan the full length of the runway, including approach areas. **Do not** engage in any other flight deck/cockpit duties while crossing a runway. Give your full attention to crossing and clearing the runway.

(4) Use exterior lighting to make your aircraft more conspicuous to other pilots. Use of exterior lighting is discussed further in paragraph 7 of this circular.

d. Communication. Some of the most important guidelines for radio communications at airports without an operating control tower include:

(1) Ensure that your radio is tuned to the appropriate Common Traffic Advisory Frequency (CTAF) or Unicom frequency. Monitor the CTAF frequency for a few minutes before beginning taxi to help you "get the picture."

(2) Ensure that the frequency is available by listening before transmitting.

(3) Transmit your intentions clearly, but be as brief as possible.

(4) Always state the name of the airport at which you are operating at the beginning and end of your transmission.

(5) Use your full call sign whenever there is another aircraft on the frequency with a similar call sign.

Caution. Some aircraft operating at airports without operating control towers may not be equipped with a radio. You must remain alert for them.

e. Taxiing. Except for not having communications with ATC, taxi operations are the same as at towered airports.

7. USE OF EXTERIOR AIRCRAFT LIGHTS TO MAKE AIRCRAFT MORE CONSPICUOUS.

a. General.

(1) Exterior aircraft lights may be used to make an aircraft operating on the airport surface more conspicuous. Pilots may use various combinations of exterior lights to convey their location and intent to other pilots. Certain exterior lights may also be used in various combinations to signal whether the aircraft is on a taxiway or on a runway, in position on the runway but holding for takeoff clearance, crossing an active runway, or moving down the runway for takeoff.

(2) Because adherence to the guidelines in this AC are voluntary and aircraft equipment varies, flightcrews are cautioned not to rely solely on the status of an aircraft's lights to determine the intentions of the flightcrew of the other aircraft. Additionally, flightcrews must remember to comply with operating limitations on the aircraft's lighting systems.

b. Exterior Lights. To the extent possible and consistent with aircraft equipage, operating limitations, and flightcrew procedures, illuminate exterior lights as follows:

(1) Engines running. Turn on the **rotating beacon** whenever an engine is running.

(2) Taxiing. Prior to commencing taxi, turn on **navigation, position, anti-collision, and logo lights**. Strobe lights should not be illuminated during taxi if they will adversely affect the vision of other pilots or ground personnel.

(3) Crossing a runway. **All exterior lights** should be illuminated when crossing a runway.

(4) Entering the departure runway for takeoff. When entering a runway to takeoff, or when taxiing into position and holding for takeoff, illuminate **one or more landing lights and all other exterior lights**. Strobe lights should not be illuminated if they will adversely affect the vision of other pilots.

(5) Takeoff. Turn on **all remaining landing lights** when takeoff clearance is received or when commencing takeoff roll at an airport without an operating control tower.

8. SUMMARY. Taxi operations require constant vigilance on the part of the entire flightcrew, not just the pilot taxiing the aircraft. The flightcrew needs to be continually aware of the movement and location of other aircraft and ground vehicles on the airport movement area. Taxi operations require the same planning, coordination, and proper execution, as do the other phases of flight operations. Safe aircraft operations can be accomplished and incidents eliminated if the flightcrew is properly trained and correctly accomplishes standard taxi operating procedures and practices.

L. Nicholas Lacey
Director, Flight Standards Service

Sample GA checklist for taxi at departure and arrival

Before starting engines:

Airport Diagram ……Review & Keep Available

Engine start **-**

Rotating beacon……...ON

Engine start checklist…….Complete

Before taxi **-**

Taxi clearance . . . . . Noted/Readback*
Airport Diagram . . . . .Review & Keep Available
Navigation lights . . . .ON
Taxi light (night operations). . . . . .ON

Taxi **–**

Ground Frequency . . . . . Monitor

Taxiway intersections . . . . . .If in doubt, verify cleared
Runway crossings . . . . . .If in doubt, verify cleared

Before crossing a runway **–**

Runway surface . . . . . Scan for conflicting traffic
Approach/departure ends . . . . Scan for approaching traffic

Crossing runway **-**

Expedite . . . . . .until entire aircraft clear of runway holding position markings

Arrival at active runway **-**

Hold short of runway holding position markings
Ready for takeoff . .. . Advise tower

Entering active runway for takeoff **-**

Takeoff clearance . . . . . Received & Readback
Runway surface . . . . . .Scan for conflicting traffic
Approach/departure ends . . . . Scan for approaching traffic
Landing/Strobes/logo lights . . . . On
Takeoff . . . . . .Expedite when cleared

Non Towered Airports:

Announce taxi intentions on CTAF / Unicom
Do 360 scan for inbound and non radio aircraft before entering runway

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In range / descent (10 NM out and at or below 10,000 for turboprop and jet aircraft):

Airport Diagram . . . . . .Review & keep available
Landing/Strobe/logo lights . . . . On

Exiting Runway:

Taxi instructions / hold shorts . . . . . Noted/ Readback*
Expedite . . . . . .until your aircraft is clear of runway holding position markings

Taxi after Landing:

Taxi clearance . . . . Received
Taxiway intersections……If in doubt, verify cleared
Runway crossings…… .…If in doubt, verify cleared

Before crossing a runway **-**

Runway surface . . . . . Scan for conflicting traffic
Approach/departure ends . . . . Scan for approaching traffic

Crossing runway **-**

Expedite . . . . . .until entire aircraft clear of runway holding position markings

Arrival at parking **-**

Shut-down checklist

****Readback all runway crossing and hold short instructions***